UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/669,568	09/25/2003	Tatsuhiko Koide	65933-046	4009

7590 12/16/2005

McDERMOTT, WILL & EMERY
600 13th Street, N.W.
Washington, DC 20005-3096

EXAMINER	
PERALTA, GINETTE	

ART UNIT	PAPER NUMBER
2814	

DATE MAILED: 12/16/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/669,568	KOIDE, TATSUHIKO	
	Examiner	Art Unit	
	Ginette Peralta	2814	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *27 July 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-26* is/are pending in the application.

4a) Of the above claim(s) *16-26* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-15* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *1/6/04*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

1. Applicant's election without traverse of claims 1-15 in the reply filed on 7/27/05 is acknowledged.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 6, 12, and 15 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

4. Where applicant acts as his or her own lexicographer to specifically define a term of a claim contrary to its ordinary meaning, the written description must clearly redefine the claim term and set forth the uncommon definition so as to put one reasonably skilled in the art on notice that the applicant intended to so redefine that claim term. *Process Control Corp. v. HydReclaim Corp.*, 190 F.3d 1350, 1357, 52 USPQ2d 1029, 1033 (Fed. Cir. 1999). The term "plain" in claims 6, 12, and 15 is used by the claim to mean "plane or a flat level surface", while the accepted meaning is "Main Entry: **plain, 1 a :** an extensive area of level or rolling treeless country **b :** a broad unbroken expanse; **2 :** something free from artifice, ornament, or extraneous matter." The term is

indefinite because the specification does not clearly redefine the term. According to the definition of plain and the use in the specification, it is examiner's interpretation that what is meant by "plain" is on a flat level surface along a same direction.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless -
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

6. Claims 1-3 are rejected under 35 U.S.C. 102(e) as being anticipated by Forbes et al. (U. S. Pat. 6,548,107 B2).

Regarding claim 1, Forbes et al. discloses in Fig. 5 a semiconductor device that comprises a semiconductor substrate 12; and a dielectric film including a porous film 30 and a non-porous film 32 in contact therewith formed on the semiconductor substrate 12; wherein the porous film 30 and the non-porous film 32 are substantially of an identical composition, as disclosed in col. 3, line 62- col. 4, line 11.

Regarding claim 2, Forbes et al. discloses in Fig. 5 that the non-porous film 32 is disposed on top of the porous film 30.

Regarding claim 3, Forbes et al. discloses in col. 4, lines 10-11 that the dielectric film is formed by CVD.

7. Claims 7, 8, 9, 12 rejected under 35 U.S.C. 102(e) as being anticipated by Xia et al. (U. S. Pat. 6,699,784).

Regarding claim 7, Xia et al. discloses in Fig. 1E a semiconductor device that comprises a semiconductor substrate; and a dielectric film including a porous film 102 and a non-porous film 104 in contact therewith formed on the semiconductor substrate; wherein the porous film and the non-porous film both contain Si, O and C, as disclosed in col. 3, line 46 to col. 4, line 22.

Regarding claim 8, Xia et al. discloses in Fig. 1E that the non-porous film is disposed on top of the porous film.

Regarding claim 9, Xia et al. discloses in col. 3, lines 46-67, and in col. 4, lines 23-31, that the dielectric film is formed by CVD.

Regarding claim 12, Xia et al. discloses in Fig. 1E that a metal interconnect 106 is provided in the dielectric film , such that an upper surface of the metal interconnect 106 and that of the dielectric film are aligned in the same plane.

8. Claims 13, and 14 are rejected under 35 U.S.C. 102(b) as being anticipated by Wallace et al. (U. S. Pat. 6,455,130 B1).

Regarding claim 13, Wallace et al. discloses in Fig. 3 a semiconductor device that comprises a semiconductor substrate 2; and a dielectric film having a substantially uniform composition including a porous portion; wherein pores in the porous portion are distributed in a relatively lower density in the proximity of an upper surface, as shown by the area designated as 8.

Regarding claim 14, Wallace et al. discloses in col. 6, lines 44-62 that the pores are distributed in a relatively lower density in the proximity of an upper surface of the dielectric film.

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

10. Claims 4, and 5, are rejected under 35 U.S.C. 103(a) as being unpatentable over Forbes et al. in view of Wallace et al..

Regarding claim 4, Forbes et al. discloses the claimed invention with the exception of disclosing the average diameter of the pores to be not less than 1 nm.

Wallace et al. discloses in col. 5, lines 64-67 and col. 6, lines 35-39 that the average diameter of pores contained in the porous portion is not less than 1 nm, by teaching that the pore size ranges from 1 nm to about 200 nm depending on the area, and the pore

size is discussed in order to control the density of the dielectric film that directly affects the dielectric constant.

Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the pore size of Forbes et al. and to use an average diameter of pores not less than 1 nm as Wallace et al. teaches for the intended purpose of controlling the density of the dielectric film, thereby controlling the dielectric constant of the film.

Regarding claim 5, Forbes et al. discloses the claimed invention with the exception of the pores being distributed in a relatively lower density in the proximity of an upper surface of the dielectric film.

Wallace et al. discloses in Fig. 3 a semiconductor device that comprises a semiconductor substrate 2; and a dielectric film having a substantially uniform composition including a porous portion; wherein pores in the porous portion are distributed in a relatively lower density in the proximity of an upper surface, as shown by the area designated as 8, wherein the varying of the density of the pores is taught for the disclosed intended purpose of providing a dielectric film with a greater mechanical strength where it is needed and a lower dielectric constant in other areas, as needed.

Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to control the density of the pores in different areas of the dielectric film, like towards the surface for the disclosed intended purpose of Wallace et

al. of providing a dielectric film with a greater mechanical strength where it is needed and a lower dielectric constant in other areas, as needed.

11. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Forbes et al. in view of Xia et al..

Forbes et al. discloses the claimed invention with the exception that the metal interconnect that is provided in the dielectric film has an upper surface that does not lie in the same plane as the upper surface of the dielectric film.

Xia et al. discloses in Fig. 1E that a metal interconnect 106 is provided in the dielectric film , such that an upper surface of the metal interconnect 106 and that of the dielectric film are aligned in the same plane, wherein the upper surface of the metal interconnect and the upper surface of the dielectric film lie on the same plane for the disclosed intended purpose of forming a local interconnect that needs an exposed surface to connect to other areas of the device.

Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have the local interconnect's upper surface, and the upper surface of the dielectric film to lie in the same plane for the well known intended purpose of exposing the surface of the local interconnect to allow access to other areas of the device and furthermore to improve the planarity of the structure thereby allowing for a multi-level structure that improves integration of the device.

12. Claims 10 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Xia et al. in view of Wallace et al..

Regarding claim 10, Xia et al. discloses the claimed invention with the exception of disclosing the average diameter of the pores to be not less than 1 nm.

Wallace et al. discloses in col. 5, lines 64-67 and col. 6, lines 35-39 that the average diameter of pores contained in the porous portion is not less than 1 nm, by teaching that the pore size ranges from 1 nm to about 200 nm depending on the area, and the pore size is discussed in order to control the density of the dielectric film that directly affects the dielectric constant.

Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the pore size of Xia et al. and to use an average diameter of pores not less than 1 nm as Wallace et al. teaches for the intended purpose of controlling the density of the dielectric film, thereby controlling the dielectric constant of the film.

Regarding claim 11, Xia et al. discloses the claimed invention with the exception of the pores being distributed in a relatively lower density in the proximity of an upper surface of the dielectric film.

Wallace et al. discloses in Fig. 3 a semiconductor device that comprises a semiconductor substrate 2; and a dielectric film having a substantially uniform composition including a porous portion; wherein pores in the porous portion are distributed in a relatively lower density in the proximity of an upper surface, as shown by the area designated as 8, wherein the varying of the density of the pores is taught for

the disclosed intended purpose of providing a dielectric film with a greater mechanical strength where it is needed and a lower dielectric constant in other areas, as needed.

Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to control the density of the pores in different areas of the dielectric film, like towards the surface for the disclosed intended purpose of Wallace et al. of providing a dielectric film with a greater mechanical strength where it is needed and a lower dielectric constant in other areas, as needed.

13. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wallace et al. in view of Xia et al..

Wallace et al. discloses the claimed invention with the exception that the metal interconnect that is provided in the dielectric film has an upper surface that does not lie in the same plane as the upper surface of the dielectric film.

Xia et al. discloses in Fig. 1E that a metal interconnect 106 is provided in the dielectric film , such that an upper surface of the metal interconnect 106 and that of the dielectric film are aligned in the same plane, wherein the upper surface of the metal interconnect and the upper surface of the dielectric film lie on the same plane for the disclosed intended purpose of forming a local interconnect that needs an exposed surface to connect to other areas of the device.

Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have the local interconnect's upper surface, and the upper surface of the dielectric film to lie in the same plane for the well known intended

purpose of exposing the surface of the local interconnect to allow access to other areas of the device and furthermore to improve the planarity of the structure thereby allowing for a multi-level structure that improves integration of the device.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ginette Peralta whose telephone number is (571) 272-1713. The examiner can normally be reached on Monday to Friday 8:00 AM- 5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached on (571) 272-1705. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

GP

HOAI PHAM
PRIMARY EXAMINER